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R & D QUARTERLY STATUS REPORT

CONTRACT LINE ITEM : # A001

DATA ITEM :# A001

CONTRACTOR: Crystal Associates Inc.
15 Industrial Park
Waldwick, NJ 07463

CONTRACT No. N00014 - 93 - C - 0225

EFFECTIVE DATE OF CONTRACT : 3 September 1993

EXPIRATION DATE OF CONTRACT: 31 August 1995

PRINCIPAL INVESTIGATOR : G.M. Loiacono

Telephone No. (201) 612 -0060

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SHORT TITLE OF WORK : " DEVELOPMENT OF $K_{1-x}Na_xTiOPO_4$ CRYSTALS
FOR NONLINEAR APPLICATIONS"

REPORTING PERIOD : 3 September to 3 December 1993

REPORT DATE : 6 December 1993

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DESCRIPTION OF PROGRESS

Crystal Growth

During this first quarter, the raw materials, crucibles and furnace parts required for this program were purchased and received.

The initial crystal growth of Na doped KTP requires seeds of identical composition in order to minimize strain effects. For each composition examined, a preliminary crystal growth run to obtain these seeds utilized the spontaneous nucleation method. A saturated solution of proper composition is superheated to 950°C. The saturation temperature of the solution was estimated based on previously determined solubility data. The solution was programmed at 5°C / day to obtain nucleation. This process was repeated for each new composition.

Table 1 lists the crystal growth parameters for the samples produced.

TABLE 1 CRYSTAL GROWTH

Parameter	KTP-035	KTP-036
Solvent	$K_6P_4O_{13}$	$K_6P_4O_{13}$
Composition (K : Na)	0.39 : 0.61	0.36 : 0.64
Growth Temperature, °C	910.	903.
Program Rates	0.5 to 2.0 °C/day	0.5 to 2.05°C/day

Measurements

A sample of KTP-035, doped with 61% Na in the melt, was oriented and fabricated. The x - faces were optically polished and the sample checked for SHG at 1064 nm. The critical phase matching (CPM) angle was estimated to be $\phi = 11^\circ$, $\theta = 90^\circ$. The concentration of Na in this crystal was estimated to be 27%, based on the data reported in Phase I, Final Report (Fig.12). The relationship between Na concentration and CPM angle for KTP-035 and three samples from Phase I are shown in Figure 1. Based on these data, another crystal growth run was initiated using a Na concentration of 64% in the melt. This should result in a crystal having noncritical phase matching (NCPM) at 1064 nm ($\phi = 0$). A sample of this run (KTP-036) is in the fabrication process and will be measured during the next quarter.

PLANS FOR NEXT QUARTER

- Complete evaluation of KTP-036.
- Determine [Na] of crystals grown.
- Establish optimum [Na] for NCPM.
- Initiate large crystal growth at optimum [Na].

FISCAL STATUS:

Amount Currently Provided on Contract: \$401,222.

Expenditures to Date: \$31,667.

Commitments to Date: --0--

Funds Required to Complete Work: \$369,555.

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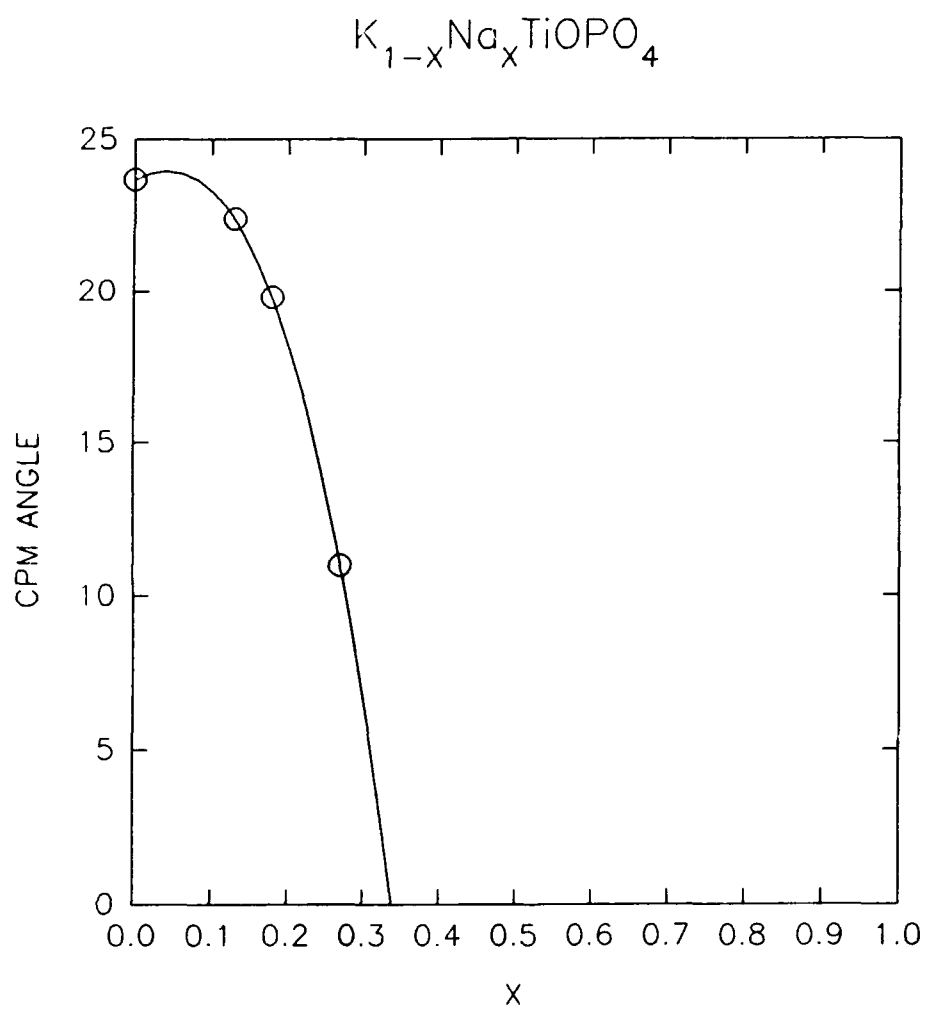


Figure 12